UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/594,284	09/26/2006	Andre Witzmann	3839	6105

7590 03/02/2010

Striker Striker & Stenby
103 East Neck Road
Huntington, NY 11743

EXAMINER	
HORNING, JOEL G	

ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
03/02/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/594,284	WITZMANN ET AL.	
	Examiner	Art Unit	
	JOEL G. HORNING	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 January 2010*.
2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-15 and 17-21* is/are pending in the application.
4a) Of the above claim(s) *10-15* is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *2-9 and 17-21* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08-05-08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 10-15 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected inventions, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on May 8th, 2009.

Information Disclosure Statement

2. The information disclosure statement filed September 26th, 2008 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. The crossed out reference was not provided. However, applicant's did provide GB 2208383, so it is possible that was the reference applicant intended to cite.

Claim Objections

3. A series of singular dependent claims is permissible in which a dependent claim refers to a preceding claim which, in turn, refers to another preceding claim.

   A claim which depends from a dependent claim should not be separated by any claim which does not also depend from said dependent claim. It should be kept in mind that a dependent claim may refer to any preceding independent claim. In general, applicant's sequence will not be changed. See MPEP § 608.01(n).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. **Claims 3-7 and 17-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bradley et al (Materials Science and Engineering A (2000) 204-212) in view of Torok et al (US 3360353) as evidenced by Triantafyllidis et al (Applied Surface Science 186(2002) 140-144).

Bradley et al is directed towards a process for treating the surface of refractory bricks used in furnaces by exposing only their surface to laser radiation, which seals the surface (closed) porosity and can result in a crack-free, dense laser treated layer on the refractory. Closing the porosity reduces the ingress of molten glassy material (slag) that is in contact with the refractory bricks, slowing down the degradation of the refractory, resulting in a longer life expectancy of the refractory (abstract). Bradley et al specifically teaches a composition for the refractory bricks based upon alumina and silica, from which the use of sillimanite (aluminum silicate)

is readily apparent (section 2.1), additionally, they identify sillimanite in their bricks (section 3.1, page 210). Since the refractory material is what is modified by the laser to produce the closed layer, the closed layer will contain materials from the refractory, including alumina, which contains aluminum **(claim 19)**.

Regarding the limitation that the laser treatment layer of the refractory be vitreous, Bradley teaches using their laser treatment to produce a smooth glassy surface zone (Section 3.1, page 209), which can be considered vitreous (vitreous means glass-like). Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use the process of Bradley to make a vitreous surface, since Bradley teaches making the layer vitreous with its process.

Additionally, in applicant's specification, page 2, lines 20-22, applicant teaches that laser treatment to minimize porosity causes siliceous components of the refractory to partially or completely vitrify. Bradley et al teaches performing a similar laser treatment process to similar materials (in particular glass forming silica containing refractory materials, commonly known as glass-ceramics) in order to produce the same effect of creating a surface region of reduced porosity to increase the durability of the refractory to contact with molten glassy material.

When a reference discloses the limitations of a claim except for a property, and the Examiner cannot determine if the reference inherently possesses that property (in this case, that at least some of the material in the layer is vitreous), the burden is shifted to Applicant(s). In re Fitzgerald, USPQ 594 and MPEP §2112

Bradley et al teaches that when an unheated substrate is laser treated, some microcracks can still remain (section 3.1, page 209, right column). Bradley et al teaches that there are several known methods to seal the porosity while also avoid these microcracks, such as by: using a continuous wave laser, performing CVD during the laser exposure or preheating the refractory (section 1, page 205, right column).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to perform one of these processes during the laser exposure in order to avoid the presence of microcracks in the resulting laser treated layer, producing a completely closed layer and by so doing increase the durability of the refractory **(claim 21)**.

Bradley et al does not specifically teach using their treated refractory bricks in a furnace that is producing glass using a Danner blowpipe.

However, Torok teaches a furnace and method for producing glass wherein molten glass is in contact with a refractory coated mandrel during the process (abstract) and the mandrel can be a Danner blowpipe (col 1, lines 45-60). Torok teaches that the refractory material on the mandrel is formed of several uniform diameter segments, which can be considered bricks (col 3, lines 68-75). Torok further teaches that the refractory bricks of the Danner blowpipe erode as the molten glass is in contact, forming glass tubing. This causes defects in the produced glass tubing which necessitates replacing the refractory material in a time consuming process (col 1, line 62 through col 2, line 14).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use the laser treated refractory bricks of Bradley in the Danner blowpipe and glassmaking process of Torok since they were refractory bricks suitable for such furnaces and it would reduce the erosion of the refractory bricks, allowing the production of longer sections of high quality pipe and increase the period between time consuming replacements of the refractory bricks of the blowpipe **(claims 17 and 20)**.

5. Regarding **claims 3-5**, Bradley et al teaches that the power density, beam diameter and the beam scanning rate are result effective variables for controlling the smoothness and surface cracking in the resulting laser treated surface (section 2.2, page 206 and also Section 3.1, page 209, left column). By extension, the laser exposure time is the quotient of the beam diameter and the beam scanning rate, so it would also be a result effective variable for controlling the smoothness and cracking in the resulting surface.

Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to choose the instantly claimed ranges of “a power density of 2 to $4W/mm^2$” **(claim 3)**, “an effective exposure time of 0.1 to 5 s” **(claim 4)**, "a scan rate of 1-10 mm/s” and a laser beam “diameter of 2-5 mm" **(claim 5)** through process optimization, since it has been held that when the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

6. Regarding **claims 6 and 7**, Bradley et al teaches using a CO_2 laser (page 205, section 2.2), which, as evidenced by Triantafyllidis et al has a wavelength of 10.6 microns (page 141, section 2).

7. Regarding **claim 18,** from figure 2c, porosity is absent from the surface of the refractory until a depth of about 200microns, thus it is clear that the porosity has been closed in a thickness greater than 100 microns, but less than 1mm (Section 3.1, page 209, right column, Figure 2c). Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to have a modified surface layer of about 200 microns, since that thickness was demonstrated.

8. **Claims 2-8 and 17-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bradley et al (Materials Science and Engineering A (2000) 204-212) in view of Torok et al (US 3360353), as applied to claim 17, further in view of Petitbon (US 4814575) as evidenced by Hancock et al (US 3929498).

Claim 8 further requires that the surface be sprayed with a powder or a solution before or during the laser treatment or that the ceramic body be infiltrated with a solution that includes zirconium or aluminum containing compounds.

Bradley is directed towards methods of laser treating ceramic bodies so that the amount of porosity on the surface of the refractory is decreased, which improves the corrosion and spalling resistance of the refractory (page 204, abstract and introduction), but it does not teach adding a powder to the surface during laser exposure.

However, Petitbon is also directed towards methods of laser treating ceramic bodies so that their surface porosity is reduced. It teaches that by spraying a ceramic powder onto the substrate during the laser treatment, so that the powder and substrate surface melt, the molten powder particles will fill available surface porosity, thus reducing the presence of porosity or microcracks on the substrate surface, improving the microstructure and improving the properties (thermal expansion coefficient, residual stress, etc) of the surface (col 2, line 40 through col 3, line 13).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention performing the process of Bradley et al in view of Torok to spray a powder at the substrate so that they melt together during laser treatment in order to avoid surface porosity or microcracks that may be present in the final surface, thus increasing the corrosion and spalling resistance as well as other properties of the substrate **(claim 8)**.

9. Regarding **claim 2,** neither Bradley et al nor Petitbon specify what the surface temperature of the substrate heated to as a result of the laser processing. However, as stated above Petitbon does teach powder is heated by the laser so that it is molten on the substrate surface. Petitbon further teaches using zirconia powder on alumina based substrates (col 4, lines 30-35). Hancock et al teach that zirconia melts at nearly 2650°C (col 1, lines 10-15).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to heat the zirconia with the laser so that it melts and that as the

molten zirconia powder forms the surface of the refractory material, that zirconia part of the surface has been heated by the laser to at least 2650°C, which is above 2000°C **(claim 2)**.

10. **Claims 3-7 and 17-21** are rejected for the same reasons they were in Bradley et al in view of Torok et al, but now using the Petitbon powder method described above, for sealing the pores.

11. **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over Bradley et al (Materials Science and Engineering A (2000) 204-212) in view of Torok et al (US 3360353), as applied to claim **17**, further in view of Brennan et al (US 4415672).

Bradley et al is directed towards treatments for glass ceramics (alumina/silica)(page 205, section 2.1), but does not teach tempering the glass ceramic refractory after the laser treatment.

However, Brennan et al is also directed towards glass-ceramics and treatments for them. It teaches that they have good thermal properties and resistance to thermal shock, but that in order to increase their mechanical strength, a variety of tempering processes are performed upon them (col 1, lines 52-68).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to further temper the glass-ceramic refractory produced by the process of Bradley et al in view of Torok (after the laser treatment) in order to increase the strength of the material.

12. **Claim 9** is alternately rejected under 35 U.S.C. 103(a) as being unpatentable over Bradley et al (Materials Science and Engineering A (2000) 204-212) in view of Torok

et al (US 3360353) further in view of Petitbon (US 4814575), as applied to claim 17, further in view of Brennan et al (US 4415672).

This claim is rejected for the same reason it was previously, but now using the Petitbon powder method of sealing the microcracks/pores in the refractory.

Response to Arguments

13. Applicant's arguments with respect to **claims 2-9 and 17-21** have been considered but are not convincing in view of the new ground(s) of rejection necessitated by amendment.

14. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "performing the sealing of the cracks with a single laser without the use of an oxyacetylene torch or a dye laser to separately heat the surface of the refractory material to a high temperature" or "with a single laser without an auxiliary surface heating device" or "completely closed completely vitreous layer") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

15. In response to applicant's argument that Bradley et al does not appear to disclose the feature that the pore-free layer is vitreous, as stated in the rejection above, Bradley et al teaches forming glassy layers using their process, which are considered vitreous. Additionally, Bradley et al teaches performing a similar laser

Deleted: can be

treatment process to similar materials (in particular glass forming silica containing refractory materials) in order to produce the same effect of creating a surface region of reduced porosity to increase the durability of the refractory to contact with molten glassy material.

When a reference discloses the limitations of a claim except for a property, and the Examiner cannot determine if the reference inherently possesses that property (in this case, that at least some of the material in the layer is vitreous), the burden is shifted to Applicant(s). In re Fitzgerald, USPQ 594 and MPEP §2112

16. Regarding applicant's argument that the layers of Bradley may contain some crystalline phases, which applicant implies would mean that the layer is not vitreous, in their specification, applicant describes their process functioning by "partially or completely vitrifying the siliceous components of the refractory material" (page 2, lines 20-25). If applicant's process may only partially vitrify only the silica components of the refractory, it appears that the claimed vitreous layer is inclusive of crystalline phases being present as long as some glassy material is present. Likewise, applicant later argues on page 17 that their laser treatment forms a "completely vitreous surface layer." However, the claim language only requires that the layer be "vitreous", again leaving open the possibility of a partially vitreous layer.
17. Applicant argues that page 3, lines 24 of their specification teaches that crystal phases are undesirable in the surface layer. Though it may be a translation issue, this citation does not appear to teach this, a plain reading indicates that crystallization in the *glass melt* is undesirable. The glass melt is not the surface

layer of the refractory but the molten glass that is eventually in contact with the refractory.

18. Applicant then argues that Petitbon teaches away from completely removing all pores and microcracks in the refractory surface.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case, the primary reference, Bradley et al teaches completely sealing off the pores, so Petitbon does not need to.

Regarding the argument that the teaching of Bradley et al is in conflict with Petitbon, which might cause confusion, it is important to consider the Petitbon reference in its entirety. Though the methods of Petitbon for removing microcracks and porosity are known and generally applicable to refractory materials, Petitbon is primarily directed towards refractory parts that are used under very different conditions than Bradley in view of Torok, to the extent that they fail under different mechanisms. Petitbon is particularly concerned with ceramic materials used in heat engines (e.g. thermal barrier coatings on turbine engine blades). It teaches that refractory materials in heat engines are exposed to high mechanical forces, close to the breaking point of those refractory materials. Petitbon teaches that porosity and microcracks weaken the refractory surface, allowing those high forces to break the refractory material. Avoiding this is Petitbon's motivation for removing the porosity

and microcracks (col 1, lines 17-34). In the context of a refractory that under very high mechanical forces, Petitbon recognizes that "the presence of a few microcracks is advantageous for increasing the toughness of the material" (col 3, lines 5-7).

However, Bradley et al in view of Torok et al is not directed towards refractory materials which are under high mechanical forces and fail as they are broken by those mechanical forces, but rather refractory materials that are chemical attack by contact with molten glass and are failing as they are eroded by the infiltration of the glass. Due to the failure method of their refractory Bradley in view of Torok teaches completely sealing off the surface of the refractory material in order to avoid that infiltration (Bradley abstract). A person of ordinary skill in the art would recognize that the refractory materials of Petitbon are under very different conditions during use than those of Bradley in view of Torok, resulting in different failure modes and different optimal surface conditions. This person would not interpret Petitbon as teaching away from completely removing all microcracks from the refractory surface of a Donner blowpipe. This person would instead recognize that a tradeoff between mechanical toughness and chemical resistance is being made and follow the clear teaching of Bradley in view of Torok, to seal off the pores in a Donner Blowpipe refractory in order to increase the chemical durability of the refractory.

19. Regarding applicant's argument that Petitbon does not teach that the surface layer is vitreous, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413,

208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case, the primary reference, Bradley et al teaches that the surface of the refractory can be glassy, so Petitbon does not need to.

20. Applicant then argues that tempering may be inherent to the Bradley laser treatment process, so a person of ordinary skill in the art would be unmotivated to perform a further thermal treatment, a la Brennan, on the produced glass-ceramic refractory material. Even if the laser treatment was recognized as a suitable tempering method for the glass-ceramic material, it would only treat the surface of the glass-ceramic, so in order to strengthen the entire glass-ceramic refractory, one of ordinary skill in the art would still have been motivated to perform the thermal tempering process of Brennan.

Conclusion

No current claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792